

CLAIMS

1. A switching power supply device comprising:

a transformer T including a primary winding N1, a secondary winding N2, and a feedback winding N3;

a first switching element Q1 connecting in series to the primary winding N1;

a control circuit 4 provided between a control terminal of the first switching element Q1 and the feedback winding N3;

a rectifier circuit 2 connecting to the secondary winding N2; and

an output voltage control circuit 3 detecting an output voltage output from the rectifier circuit 2 and feeding back the output voltage to the control circuit 4 through one system,

wherein the control circuit 4 includes an on-period control circuit 6 for turning off the first switching element Q1 in an on-state based on a feedback signal transmitted from the output voltage control circuit 3 through one system under non-light load; and an off-period control circuit 5 for controlling an off-period of the first switching element Q1 by delaying turn-on of the first switching element Q1 based on the feedback signal under light load.

2. The switching power supply device according to Claim 1, further comprising:

an impedance circuit 8 provided to connect the off-period control circuit 5 to the on-period control circuit 6, the impedance thereof changing based on the feedback signal,

wherein control of the off-period control circuit 5 under light load and control of the on-period control circuit 6 under non-light load are sequentially performed in accordance with change in the impedance of the impedance circuit.

3. The switching power supply device according to Claim 1 or 2, wherein the off-period control circuit 5 includes a third switching element Q3 provided between the control terminal of the first switching element Q1 and the feedback winding N3 and a fourth switching element Q4 provided between a control terminal of the third switching element Q3 and a ground,

wherein the on-period control circuit 6 includes a second switching element Q2 provided between the control terminal of the first switching element Q1 and the ground and a time constant circuit including a capacitor C3 for applying a control voltage to the second switching element Q2, and

wherein the impedance circuit 8 includes a first path p1 for feeding a current generated by the feedback signal to the capacitor C3 and a second path p2 serving as a bypass for feeding the current to the ground.

4. The switching power supply device according to any of Claims 1 to 3, wherein a minimum on-period is set in the on-period controlled by the on-period control circuit 6.

5. The switching power supply device according to Claim 4, wherein the impedance circuit 8 is provided with a clamp circuit for controlling a voltage of the capacitor C3 in the on-period control circuit 6 for determining the control voltage of the second switching element Q2 at a predetermined value when the first switching element Q1 is in an off-state.

6. The switching power supply device according to Claim 3, wherein the second path is a bypass circuit for feeding the current generated by the feedback signal only when the first switching element Q1 is in an off-state.

7. The switching power supply device according to any of Claims 1 to 6, wherein the off-period control circuit 5 includes a limit circuit 9 for setting an upper limit of a voltage applied to the control terminal of the first switching element Q1.

8. An electronic apparatus including the switching power supply device according to any of Claims 1 to 7 in a power supply circuit unit.